

SP

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/882,423	LI, SHUO-YEN ROBERT	
	<b>Examiner</b>	<b>Art Unit</b>	
	John Pezzlo	2662	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 9/11/2001.
2. ☒ The allowed claim(s) is/are 10-23(renumbered 1-14 respectively).
3. ☒ The drawings filed on 15 June 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

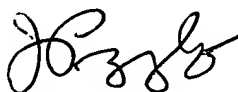
\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Paper No./Mail Date <u>6/15/01, 6/15/05</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____</li> </ol> |
|---|--|

  
**JOHN PEZZLO**  
**PRIMARY EXAMINER**

**DETAILED ACTION*****Allowable Subject Matter***

Claims 10-23 are allowable over the prior art of record.

***Reasons for Allowance***

The following is an examiner's statement of reasons for allowance: Applicant has claimed the following uniquely distinct features in the instant invention, which are not found in the prior art, either singularly or in combination:

1. Regarding claim 10 - A  $2^n \times 2^n$  generalized divide-and-conquer network,  $n > 3$ , comprising  $2^{\lfloor n/2 \rfloor} 2^{\lceil n/2 \rceil} \times 2^{\lceil n/2 \rceil}$  input nodes, each of the  $2^{\lfloor n/2 \rfloor}$  input nodes being a  $2^{\lceil n/2 \rceil} \times 2^{\lceil n/2 \rceil}$  generalized divide-and-conquer network,  $2^{\lceil n/2 \rceil} 2^{\lfloor n/2 \rfloor} \times 2^{\lfloor n/2 \rfloor}$  output nodes, each of the  $2^{\lceil n/2 \rceil}$  output nodes being a  $2^{\lfloor n/2 \rfloor} \times 2^{\lfloor n/2 \rfloor}$  generalized divide-and-conquer network, and an interstage exchange connecting the input nodes to the output nodes, wherein the interstage exchange is a bit-permuting exchange induced by a permutation  $\sigma$  on integers from 1 to  $n$  such that  $\sigma$  maps the numbers  $\lfloor n/2 \rfloor + 1, \lfloor n/2 \rfloor + 2, \dots, n$ , into the set  $\{1, 2, \dots, \lceil n/2 \rceil\}$  excluding the bit-permuting exchange equal to the  $\lfloor n/2 \rfloor^{\text{th}}$  power of SHUF<sup>(n)</sup>, and wherein each  $2^k \times 2^k$  generalized divide-and-conquer network ( $k < n$ ), being representative of each of the input nodes and each of the output nodes, is implemented by forming the bit-permuting 2-stage tensor product, excluding the plain 2-stage tensor product, between a  $2^{\lceil k/2 \rceil} \times 2^{\lceil k/2 \rceil}$  generalized divide-and-conquer network and a  $2^{\lfloor k/2 \rfloor} \times 2^{\lfloor k/2 \rfloor}$  generalized

Art Unit: 2662

divide-and-conquer network, recursively until  $k=1$ , such that a  $2 \times 2$  generalized divide-and-conquer network is a single cell.

2. Regarding claim 12 - A  $2^n \times 2^n$  generalized divide-and-conquer network,  $n > 3$ , achieving an optimal layout complexity under the 2-layer Manhattan model with reserved layers and optimal structural modularity among all  $2^n \times 2^n$  banyan-type networks, the network comprising  $2^{\lfloor n/2 \rfloor} 2^{\lceil n/2 \rceil} \times 2^{\lceil n/2 \rceil}$  input nodes, each of the  $2^{\lfloor n/2 \rfloor}$  input nodes being a  $2^{\lceil n/2 \rceil} \times 2^{\lceil n/2 \rceil}$  generalized divide-and-conquer network,  $2^{\lceil n/2 \rceil} 2^{\lfloor n/2 \rfloor} \times 2^{\lfloor n/2 \rfloor}$  output nodes, each of the  $2^{\lceil n/2 \rceil}$  output nodes being a  $2^{\lfloor n/2 \rfloor} \times 2^{\lfloor n/2 \rfloor}$  generalized divide-and-conquer network, and an interstage exchange connecting the input nodes to the output nodes, wherein each  $2^k \times 2^k$  generalized divide-and-conquer network ( $k < n$ ), being representative of each of the input nodes and each of the output nodes, is implemented by forming the bit-permuting 2-stage tensor product, excluding the plain 2-stage tensor product, between a  $2^{\lceil k/2 \rceil} \times 2^{\lceil k/2 \rceil}$  generalized divide-and-conquer network and a  $2^{\lfloor k/2 \rfloor} \times 2^{\lfloor k/2 \rfloor}$  generalized divide-and-conquer network, recursively until  $k=1$ , such that a  $2 \times 2$  generalized divide-and-conquer network is a single cell.

3. Regarding claim 14 - A method for constructing a  $2^n \times 2^n$  generalized divide-and-conquer network,  $n > 3$ , comprising determining an  $n$ -leaf balanced binary tree indicative of the generalized divide-and-conquer network,  $n > 3$ , and generating a recursive bit-permuting 2-stage interconnection network, excluding the recursive plain 2-stage interconnection network, associated with the  $n$ -leaf balanced binary tree.

4. Regarding claim 16 - A method for recursively constructing a  $2^n \times 2^n$  generalized divide-and-conquer network,  $n > 3$ , comprising forming the bit-permuting 2-stage tensor product, excluding the plain 2-stage tensor product, between a  $2^{\lceil k/2 \rceil} \times 2^{\lceil k/2 \rceil}$  generalized

Art Unit: 2662

divide-and-conquer network and a  $2^{\lfloor k/2 \rfloor} \times 2^{\lfloor k/2 \rfloor}$  generalized divide-and-conquer network, and recursively, each  $2^k \times 2^k$  generalized divide-and-conquer network ( $k < n$ ) is constructed by forming the bit-permuting 2-stage tensor product, excluding the plain 2-stage tensor product, between a  $2^{\lceil k/2 \rceil} \times 2^{\lceil k/2 \rceil}$  generalized divide-and-conquer network and a  $2^{\lfloor k/2 \rfloor} \times 2^{\lfloor k/2 \rfloor}$  generalized divide-and-conquer network, until  $k=1$ , where a  $2 \times 2$  generalized divide-and-conquer network is a single cell.

5. Regarding claim 22 - A method for recursively constructing a  $2^n \times 2^n$  generalized divide-and-conquer network,  $n > 3$ , in correspondence to an  $n$ -leaf balanced binary tree, the method comprising constructing, in correspondence to the root  $R$  of the tree, the  $2^n \times 2^n$  generalized divide-and-conquer network by forming the bit-permuting 2-stage tensor product between a  $2^p \times 2^p$  generalized divide-and-conquer network which is associated with the left-son of  $R$  having a weight of  $p$  and a  $2^q \times 2^q$  generalized divide-and-conquer network which is associated with the right-son of  $R$  having a weight of  $q$ , with  $|p-q| \leq 1$  and wherein  $p = \lceil n/2 \rceil$  and  $q = \lfloor n/2 \rfloor$ , or  $p = \lfloor n/2 \rfloor$  and  $q = \lceil n/2 \rceil$ , and recursively, in correspondence to a generic internal node  $H$  with weight  $k$  ( $k < n$ ) until  $k=1$  and wherein a  $2 \times 2$  generalized divide-and-conquer network is a single cell, constructing a  $2^k \times 2^k$  generalized divide-and-conquer network by forming the bit-permuting 2-stage tensor product between a  $2^s \times 2^s$  generalized divide-and-conquer network which is associated with the left-son of  $H$  having a weight of  $s$  and a  $2^t \times 2^t$  generalized divide-and-conquer network which is associated with the right-son of  $H$  having a weight of  $t$ , with  $|s-t| \leq 1$  and wherein  $s = \lceil k/2 \rceil$  and  $t = \lfloor k/2 \rfloor$ , or  $s = \lfloor k/2 \rfloor$  and  $t = \lceil k/2 \rceil$ .

The closest prior art, either singularly or in combination, fail to anticipate or render the above limitations obvious.

Art Unit: 2662

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Claims 10-23 being allowable, **Prosecution On The Merits Is Closed** in this application.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Yazdani et al. (US 6,859,455 B1) discloses a method and apparatus for building and using multi-dimensional index trees for multi-dimensional data objects.
2. Sethi et al. (US 6,269,353 B1) discloses a system for constructing decision tree classifiers using structure-driven induction.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Pezzlo whose telephone number is (571) 272-3090. The examiner can normally be reached on Monday to Friday from 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou, can be reached on (571) 272-3088. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Art Unit: 2662

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2600.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C.

or faxed to:

(571) 272-8300

For informal or draft communications, please label "PROPOSED" or "DRAFT"

Hand delivered responses should be brought to:


Jefferson Building

500 Dulany Street

Alexandria, VA.

John Pezzlo

23 August 2005



**JOHN PEZZLO**  
**PRIMARY EXAMINER**